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ABSTRACT

This paper is a progress report on a series of experiments which have sought to probe the cognitive development of mildly mentally retarded and normal children, using conservation training as the principal research tool. Three- and 4-year-old children were given Verbal Rule instruction in a 2 x 2 x 2 design intended to probe the importance of identity, reversibility, and compensation explanations in the training of number and length concepts. The method replicated an earlier study of educationally subnormal children. Striking similarities were found in the responses of both groups of children. Identity was the primary factor in conservation acquisition; reversibility was important as well; compensation strategy proved to be of little value to either group. Justifications offered by both groups also were very similar. These varied according to the quantity being explained rather than the training received. Implications of the findings for use of conservation training as a diagnostic tool by which the truly retarded may be differentiated from other educationally subnormal children are briefly discussed. (Author/RH)

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(abstract)

IDENTITY, REVERSIBILITY, AND COMPENSATION: AN EXAMINATION

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Three and four year old children were given Verbal Rule instruction in a 2 x 2 x 2 design intended to probe the importance of identity, reversibility, and compensation explanations in the training of number and length concepts. The method replicated an earlier study of educationally subnormal children. Striking similarities were found in the responses of both groups of children. Identity was the primary factor in conservation acquisition; reversibility was important as well; compensation strategy proved to be of little value to either group. Justifications offered by both groups also were very similar. These varied according to the quantity being explained rather than the training received.

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IDENTITY, REVERSIBILITY, AND COMPENSATION: AN EXAMINATION

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This paper is a progress report on a series of experiments which have sought to probe the cognitive development of mildly mentally retarded and normal children, using conservation training as the principal research tool. The retarded (ESN) children are from Educationally Subnormal day schools in London; the nursery school children are from Berkeley.

Since details of the experimental method were very recently published (Field, 1977), I will not review them here. My emphasis here will be on similarities of performance by the two sorts of children, retarded and normal -- and there were far more similarities than differences -- in order to show the processes by which all children seem to come to understand these essential concepts.

My previous research compared Verbal Rule training, originated by Beilin (1965), and Learning Set training, from Gelman (1969). I always found training more effective for retarded and nonretarded children, so these recent experiments were designed to tease out what it is about Verbal Rule training which has led to such successful and long lasting results. In both experiments completely nonconserving children were arranged in eight groups, matched for CA, MA, sex, and school. Information about the subjects is given in Table 1.

These eight groups of children received identical treatment: three training sessions, the same amount of individual attention, the same tangible and intangible reinforcements. But there was one crucial difference. This difference was in the content of the Verbal Rule that each child heard 60 times in training. The groups were arranged in a 2 x 2 x 2 factorial design to provide every combination of verbal explanations. Figure 1 may be helpful in visualising how this was employed. Three of the groups heard only one type of Verbal Rule: identity (I), reversibility (R) or compensation (C).

Three other groups heard combinations of two kinds of explanations: IR, IC, or RC. One group heard I, R, & C explanations in equal numbers, and one group engaged in another activity with the investigator: we played the game of draughts.

In addition, the nursery study also included a Learning Set group, which received the same training as the others, except that no verbal explanations were offered.

RESULTS

Training.

Figure 2 shows training scores for all groups. In both experiments there was a highly significant improvement in scores over time, $F(1,104) = 57.5$, $p < .0001$. Also, the ESN children's scores were consistently higher than those of the normal children, $F(3,102) = 2.00$, $p < .04$. A similar difference had been noted earlier, as well.

Posttest.

While training had been confined to two concepts only, number and length, the children were tested on five quantities in the Posttest. Table 2 shows one important finding of the study. The same effects were significant in conservation acquisition, both for the mentally retarded and for the young normal children. The first part of the Table considers all of the tested quantities together: identity and reversibility effects were significant for both But number, mass, length, liquid, and weight are separate concepts, acquired over a considerable amount of time in a child's life, and it makes sense to examine each of them separately. These analyses also are shown in Table 2. They demonstrate that training which worked well for one group worked well for the other, and the methods which were not effective for one group were equally ineffective with the other group. This seems to be corroboration of evidence that retarded and normal children learn and develop

their cognitive structures in the same ways, for both of these groups responded very similarly to the rather subtle differences of training in these complex skills.

It is clear that some training explanations are more efficacious than others. In the ESN experiment, every child who heard any identity explanations conserved at least one quantity on the posttest. This was true in the nursery study as well, with two exceptions. One was the child with the youngest MA, the other was the child with the youngest CA. These two did not learn to conserve, despite having identity included in their explanations.

Table 3 gives the scores earned by each group. Several important results are shown here. First, the ESNs scored higher than the nursery children in almost all groups. Second, this was true even when only those nursery children of MA $\geq$ 60 are considered. Third, in nearly all cases the "better" groups were the same, ESN or nursery, immediate or delayed posttest.

Figure 3 charts the posttest scores of all children in the nursery study by MA. Since only two quantities were trained, those children who conserved more than two showed generalization, considered by Piaget and others to be essential for demonstrating acquisition of conservation. It can be seen that those children MA $>$ 60 showed much greater conservation mastery. Only one child MA $<$ 60 showed generalization, while 19 children MA $>$ 60 conserved three or more quantities.

Delayed Posttest.

In all but one of my London studies I was able to give a second posttest, and I found that those children who were trainee by a Verbal method did not lose their conservation understanding when measured after 4 to 16 months (Field 1974, in press). The second posttest of the nursery children took place $2\frac{1}{2}$ to 5 months after the first, depending on school group and holiday scheduling.

Figure 4 shows that a number of the younger children had lost their conservation understanding in that time. Whereas 13 children had shown no conservation in the first posttest, this was true for 27 on the second posttest. All but four of the children MA 60 lost the apparently tenuous conservation understanding which they showed at first, and two of those only conserved number. Remember Piaget's insistence that only testing over time can prove genuine conservation acquisition.

However, look again at Table 3. You will see that in spite of the falling off of the younger children, the overall group scores increased from the first posttest to the second. Apparently those children who had truly acquired conservation continued to profit from training and gained further understanding in the time between posttests. Where 20 children had shown generalised understanding by conserving three or more quantities on the first posttest, 23 did so on the second.

Justifications.

There has been considerable discussion about the importance or even the desirability of requiring justifications from the child after he has given his conserving judgement. I think much additional information is gleaned in this way, and I must point out that the justifications given by the children in all of my studies have provided some of my most intriguing findings. In the ESN study, analysing the effect of the training on the justifications given by the children, I was astonished to discover that the effects noted in the conservation mastery did not govern the production of justifications. Instead, the quantity itself was more important than the type of training given in eliciting adequate justifications.

Since the subjects were given, over all, equal numbers of identity, reversibility, and compensation explanations in training, one would expect equal numbers of identity, reversibility, and compensation justifications

in return, if training were the only influence. But I found children who had heard no identity explanations at all during training giving identity justifications for number, and reversibility justifications were given most often to length, regardless of what the training had been. Justifications were slightly more evenly distributed for the other quantities, though liquid was more likely to elicit compensation justifications than the other quantities, and identity was still the sole significant effect for mass and liquid. Interestingly, very similar results were found in the nursery study.

Table 4 gives the distribution of justifications for all the quantities and for each one separately. It will be seen that overall more identity justifications were offered by both groups of children. The significant difference in the comparison for all quantities is caused by the small count of compensation justifications. The differences for mass and liquid stem from the same lack of compensation. But number judgements were distinguished by a disproportionately large number of identity justifications, and length exhibited a similarly large proportion of reversibility justifications. Table 4 also compares the findings of the two studies. There is remarkably little difference between the retarded and the normal children in the types of justifications they gave.

CONCLUSIONS

I have tried to make three points here.

First, the identity construct seems to be the most important element in conservation acquisition. Reversibility is important as well, but compensation seems to have little value. Since these findings were consistent for such diverse groups of children, I think that we can have considerable confidence in them.

Second, as far as I know no one else has examined the justifications given to a variety of concepts in this way. Since each concept tends to dic-

tate its own rationale, it is necessary to examine a number of quantities together and separately, as was done here, to understand the patterns of justifications.

Third, apparently there is a youngest age at which a child can acquire conservation, but it seems that this age is younger than we had thought.

In closing, may I observe that nearly untouched in this paper are the important implications for the treatment of mentally retarded children. Elsewhere (Field, 1974, in press) I have suggested that training in conservation may prove useful as a diagnostic tool to distinguish those who are truly retarded from those whose learning disabilities stem from other sources. Some ESNs showed a greater learning potential than did others. Those children who could progress from nonconservation to full conservation as a result of less than 1½ hours of individual attention, reinforcements, and verbal training, and also retain this understanding for as long as 16 months, are importantly different from those who could not. The next step in this series will be to investigate ways to utilize conservation training as a new diagnostic tool. I would welcome an opportunity to learn the views of others about this possibility.

References

Beilin, H. Learning and operational convergence in logical thought development. Journal of Experimental Child Psychology, 1965, 2, 317-339.

Field, D. Long-term effects of conservation training with educationally subnormal children. Journal of Special Education, 1974, 8, 237-245.

Field, D. The importance of the verbal content in the training of Piagetian conservation skills. Child Development, 1977, 48, 1583-1592.

Field, D. How children in Educationally Subnormal schools in London learn conservation skills. Proceedings of the Seventh Interdisciplinary Conference on Piagetian Theory and its Implications for the Helping Professions. University of Southern California, Los Angeles (in press).

Gelman, R. Conservation acquisition: A problem of learning to attend to relevant attributes. Journal of Experimental Child Psychology, 1969, 7, 167-187.

Jewson, J., & H. Beilin. Linguistic change with nonverbal cognitive training. (Submitted for publication)

Piaget, J. Forward. In B. Inhelder, H. Sinclair, & M. Bovet (Eds.) Learning and the Development of Cognition. London: Routledge & Kegan Paul, 1974.

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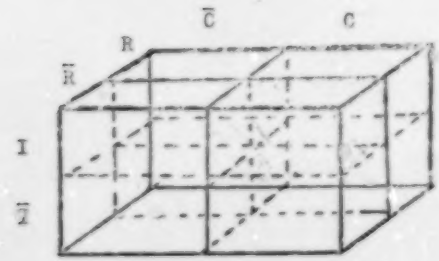
Table 1

Comparison of Children Studied

	ESN	Nursery
MA: Mean	72 months (6:0)	65 months (5:5)
Range	55 - 101	37 - 90
CA: Mean	121 months (10:1)	50.7 months (4:3)
Range	96 - 146	36 - 61
Sex: Female	16	30
Male	32	33
School 1 N =	23	34
School 2 N =	25	29
Total Subjects	48	63
N Each Group	6	7

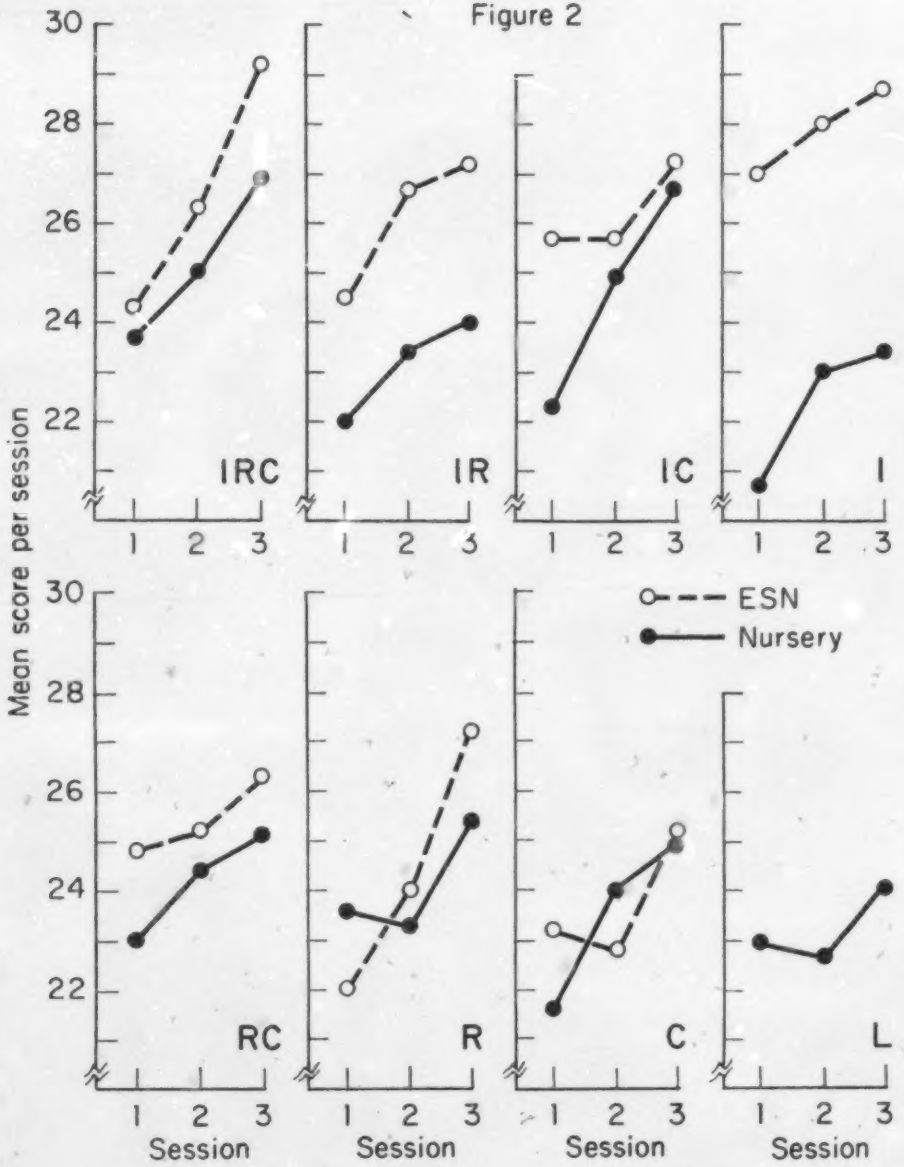
Figure 1

The IRC Factorial Design



Note: The shaded block is the IC group.

Figure 2



Comparing ESN and Nursery Studies: Training Scores for Each Group

Table 2

A Comparison of the Effects of Training

ESN and Nursery Experiments

Concept	Effect	ESN Study F(1,40)	ESN Study p <	Nursery Study F(1,48)	Nursery Study p <
Total (all quantities together)	*I	13.67	.0007	12.08	.001
	*R	12.19	.0012	5.52	.023
	*C	.39		.08	
	**IR	.04		.22	
	**IC	2.07		3.89	
	**RC	.17		.72	
	**IRC	4.22	.05	.43	
Number	I	19.23	.0001	15.84	.001
	R	3.08		.84	
	C	.77		.84	
	IR	3.08		.84	
	IC	.77		2.34	
	RC	3.08		.09	
	IRC	3.08		.09	
Mass	I	1.82		1.71	
	R	11.36	.002	6.86	.012
	C	.00		1.71	
	IR	.45		.00	
	IC	.00		6.86	.012
	RC	.45		1.71	
	IRC	4.09	.05	1.71	
Length	I	9.88	.003	7.89	.007
	R	5.98	.019	1.26	
	C	3.05		1.26	
	IR	1.10		1.26	
	IC	3.05		1.26	
	RC	.12		.32	
	IRC	1.10		.32	
Liquid	I	5.70	.022	3.97	.052
	R	5.70	.022	3.97	.052
	C	.12		.73	
	IR	.12		.08	
	IC	5.70		.08	
	RC	2.91		.08	
	IRC	1.05		.08	
Weight	I	3.75	.059	Only 3 children conserved Weight, so an analysis would be meaningless.	
	R	3.75	.059		
	C	.00			
	IR	.42			
	IC	.00			
	RC	.00			
	IRC	1.67			

*main effect
**interaction

Figure 3

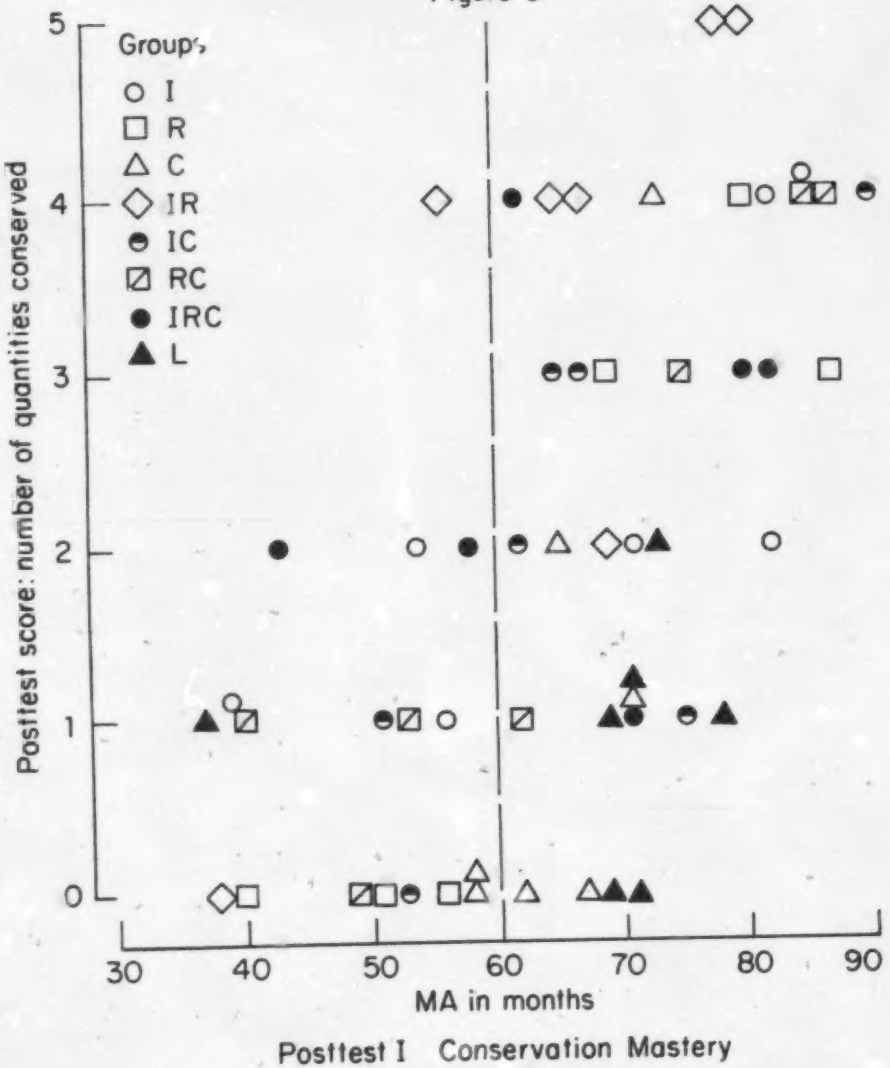


Table 3

Posttest Scores of Training Groups

Group	ESN Study	Nursery Study Posttest I	Nursery Study Posttest II	Nursery Study MA ⩾60 Posttest I	Nursery Study MA ⩾60 Posttest II
IRC	4.17	2.50	2.83	2.75	3.25
IR	3.50	3.43	2.00	4.00	2.40
I	3.17	2.29	2.43	3.00	3.00
RC	2.50	2.00	2.00	3.00	3.25
R	2.33	1.43	.86	2.50	1.50
IC	1.67	2.00	2.00	2.60	2.60
C	1.67	1.00	1.57	1.40	2.20
L	—	.86	.71	.83	.83
Control	.17	.29	.43	.50	.75

Note: One point was awarded for each quantity mastered.
Total score possible: 5.

Figure 4

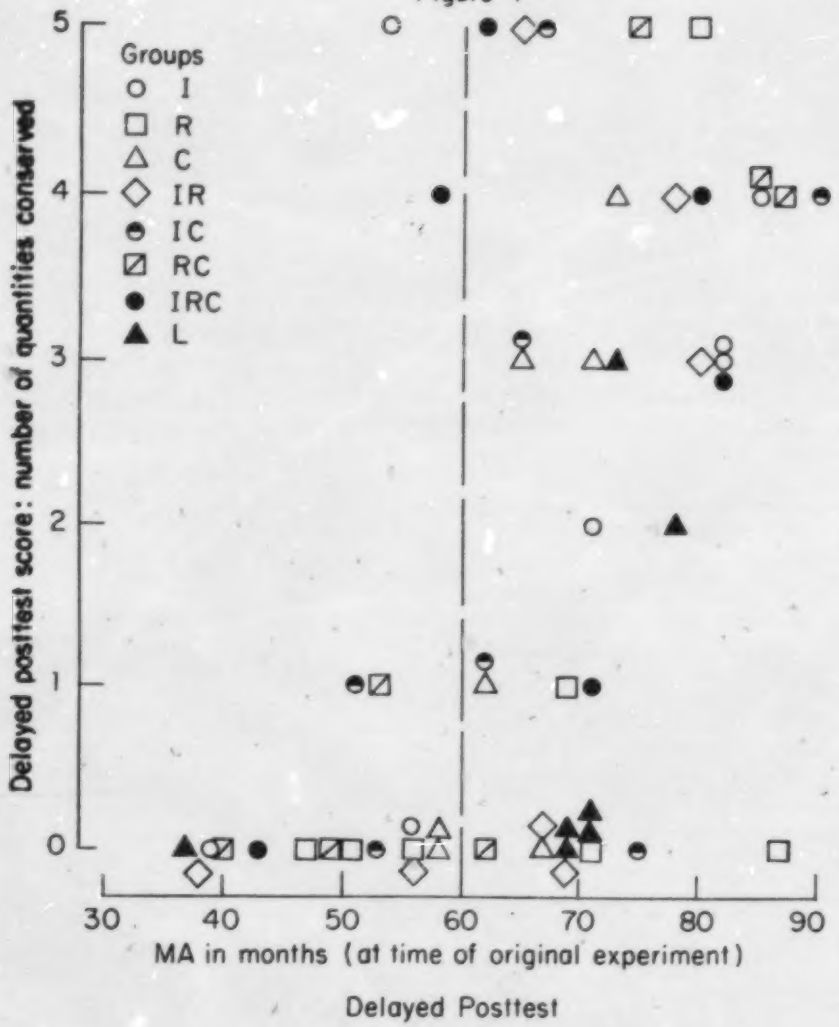


Table 4

Differences in Types of Justifications Given for Each Quantity

Quantity	Study	Types of Justification							For Each Study		Comparing Justifications for the Two Studies	
		I	R	C	IR				χ^2_3	p<	χ^2_3	p<
Total (all Quantities together)	Nursery	47	43	6	25				34.99	.001	1.99	ns
	ESN	66	46	8	42				42.94	.001		
Number	Nursery	22	9	3	9				17.93	.001	2.61	ns
	ESN	27	5	1	7				40.40	.001		
Mass	Nursery	10	7	1	4				8.18	.05	2.57	ns
	ESN	9	5	1	11				5.08	ns		
Length	Nursery	5	24	1	6				34.88	.001	1.17	ns
	ESN	5	26	0	8				29.70	.001		
Weight	Nursery	4	0	0	0				not analyzed		not analyzed	
	ESN	15	3	3	11				13.51	.01		
		I	R	C	IR	IC	RC	IRC				
Liquid	Nursery	10	3	1	6	1			$\chi^2_4 = 14.00$	p < .01	$\chi^2_6 = 3.45$	ns
	ESN	10	7	1	5	3	2	2	$\chi^2_6 = 14.81$	p < .01		